## NC

Nanotech could be utilized in the manufacturing sector to prioritize environmental protection over resource extraction.

**EPA 7** writes[[1]](#footnote-1)

**Nanotech**nology **may** be able to **advance environmental protection by addressing** the long-term **sustainability of resources** and resource systems. Listed in Table 2 are examples describing actual and potential applications relating to water, energy, and materials. Some applications bridge between several resource outcomes. For example, green manufacturing using **nanotech**nology (both top down and bottom up) **can improve the manufacturing process by increasing materials and energy efficiency, reducing** the need for **solvents**, **and** reducing **waste products**. Many of the following applications can and should be supported by other agencies. However, EPA has an interest in helping to guide the work in these areas. 2.3.1 Water **Nanotech**nology **has** the **potential to contribute to** long-term water quality, availability, and **viability of water resources**, such as **through advanced filtration** that enables more water re-use, recycling, and desalinization. For example, nanotechnology-based flow-through capacitors (FTC) have been designed that desalt seawater using one-tenth the energy of state-of-the art reverse osmosis and one-hundreth of the energy of the energy of distillation systems. The projected capital and operation costs of FTC-based systems are expected to be one-third less than conventional osmosis systems (NNI, 2000). Applications potentially extend even more broadly to ecological health. One long-term challenge to water quality in the Gulf of Mexico, the Chesapeake Bay, and elsewhere is the build up of nutrients and toxic substances due to runoff from agriculture, lawns, and gardens. In general with current practices, about 150% of nitrogen required for plant uptake is applied as fertilizer (Frink et al., 1996). **Fertilizers and pesticides that incorporate nanotech**nology **may result in less** agricultural and lawn/garden **runoff** of nitrogen, phosphorous, and toxic substances, which is potentially an important emerging application for nanotechnology that can contribute to sustainability. **These potential applications are still in the early research stage** (USDA, 2003). Applications involving dispersive uses of nanomaterials in water have the potential for wide exposures to aquatic life and humans. Therefore, it is important to understand the toxicity and environmental fate of these nanomaterials. 2.3.2 Energy **There is potential for nanotech**nology **to contribute to reductions in energy demand through lighter materials for vehicles**, materials, and geometries that contribute to more effective temperature control, technologies that improve manufacturing process efficiency, materials that increase the efficiency of electrical components and transmission lines, **and** materials that could contribute to **a new generation of fuel cells** and a potential hydrogen economy. However, because the manufacture of nanomaterials can be energy-intensive, it is important to consider the entire product lifecycle in developing and analyzing these technologies.

Environmental protection will incentivize developing countries to develop nanotech for manufacturing.

**CRN 4** writes[[2]](#footnote-2)

Those of us who read (and write) this blog know, of course, that there is an answer to these problems: a **clean, cheap, environmentally friendly** form of light **manufacturing** that **will provide high quality goods** to all without raping the land, and that could turn China into the envy of the Earth. It may be just a matter of time until **nanotech**nology **can deliver on these promises** and more, but will it be soon enough? A few days ago, we mentioned here that **molecular manufacturing might**, in fact, **be invented** somewhere **in the developing world sooner than in the U**nited **S**tates, Europe or Japan. Considering the enormous incentives — economic, environmental, and, yes, military — that less developed nations might see in nanotechnology, this scenario does not seem at all implausible. You also could make a strong argument that such a beneficial technology should be developed as rapidly as possible. You could argue that the **humanitarian and ecological benefits alone should be enough to motivate all** leading **nations to** band together and **bring this to pass**. You could say this, and CRN does say this!

Nanotech in the manufacturing sector leads to grey goo which causes extinction and turns case. **Prado 12** writes[[3]](#footnote-3)

Some nanotechnology **researchers are looking into** ways to manufacture nano products by, for example, a fluid of raw materials whereby a manmade microscopic agent can reproduce in this fluid and in the process create large quantities of nano scale products relatively autonomously. These are **manufacturing applications of nanotech**nology**, and this is an area where some grave threats exist to Earth's biosphere. The best known** human **extinction threat** of nanotechnology **is** the creation of **a selfreplicating "nanite**". It could derive its energy by **consuming** plant and/or animal matter (eating **us like flesh eating bacteria**, except potentially far worse), **or** it could use sunlight and **its** own **method of photosynthesis** using elements in the air, water and/or surface material. It **could turn the Earth's biosphere into dust or** so-called **"grey goo"** very quickly, rendering Earth practically lifeless. **This** capability may be decades away, but it **might come soon**er. It is clearly a possibility. Before then, it's possible that **a nanotech**nology **lab**oratory **could manufacture a microscopic catalyst** or other substance in great quantity which is **absorbed by plants or animals** and interferes with cellular functions in some way**,** thereby **degrading us to the point of inability to** reproduce or **function for survival**. It may possibly even reproducing itself like a virus, and unlike anything ever seen before, so that it spreads to potentially wipe out a lot of life. Keep in mind that 100 nm **particles are so small** and lightweight that **they** easily **blow** around **in the air, and** can **spread worldwide very quickly.** There are tremendous amounts of money being poured into nanotechnology biomedical research and development in attempts to treat diseases and aging, as well as human biological enhancement. The **desires for** the potential **human benefit**s **and** potential **profit**s from nanotechnology are sure to **make many** people **ignore many risks such as human extinction or** sudden **ecosystem destruction**. We see that rampantly already.

## Weighing

Nanotech is the most likely scenario for extinction. The author accounts for environmental harms.

**Coughlan 13** writes[[4]](#footnote-4)

The Swedish-born director of the institute, Nick **Bostrom**, **says** the stakes couldn't be higher. If we get it wrong, **this could be humanity's final century**. Been there, survived it **So what are the greatest dangers?** First the good news. Pandemics and natural disasters might cause colossal and catastrophic loss of life, but Dr **Bostrom believes humanity would** be **likely** to **survive**. This is because as a species we've already outlasted many thousands of years of **disease, famine, flood,** predators, persecution, **earthquakes and enviro**nmental **change**. So the odds remain in our favour. And in the time frame of a century, he says the **risk of extinction from asteroid impacts and** super-**volcanic eruptions remains "extremely small"**. Even the unprecedented self-inflicted losses in the 20th Century in two world wars, and the Spanish flu epidemic, failed to halt the upward rise in the global human population. **Nuclear war might cause** appalling **destruction, but enough individuals could survive to allow the species to continue.** If that's the feelgood reassurance out of the way, what should we really be worrying about? Dr **Bostrom believes we've entered a new** kind of **tech**nological **era with the capacity to threaten our future as never before. These are "threats we have no track record of surviving".** Lack of control Likening it to a dangerous weapon in the hands of a child, he says the advance of technology has overtaken our capacity to control the possible consequences. Nick Experiments in areas such as synthetic biology, nanotechnology and machine intelligence are hurtling forward into the territory of the unintended and unpredictable. Synthetic biology, where biology meets engineering, promises great medical benefits. But Dr Bostrom is concerned about unforeseen consequences in manipulating the boundaries of human biology. **Nanotech**nology**,** working **at a molecular** or atomic **level, could** also **become highly destructive if used for war**fare, he argues. He has written that **future governments will have a major challenge to** control and **restrict misuses.**

## Arms Races Impact

Nanotech manufacturing risks arms races that cause extinction, outweighs nuclear war.

**Vassar and Frietas 6** writes[[5]](#footnote-5)

**Molecular manufacturing** also **raises the possibility of horrifically effective** nonreplicating **nanoweapons.** The difference in purpose between a nanotech weapon and an ecophage is that an ecophage seeks primarily to replicate by consuming biological matter, thus becoming a direct resource competitor to biology, while nanotech weapons can have a far greater diversity of purposes, including killing only specific parties. Ecophages must devote significant resources to replication, whereas nanoweapons can focus solely on destruction. This means that active nanoweapons can be far more dangerous per gram than ecophages, and can act much more rapidly because they need not waste time replicating. As an example, the smallest insect is about 200 microns. This creates a plausible size estimate for a nanotech-built antipersonnel weapon capable of seeking and injecting toxin into unprotected humans. The human lethal dose of botulism toxin is about 100 nanograms, or about 1/100 the volume of the weapon. **As many as 50 billion toxin-carrying devices —** theoretically **enough to kill every human on earth — could be packed into a single suitcase. Guns** of all sizes **would be far more powerful, and their bullets could be self-guided.** Aerospace hardware would be far lighter and higher performance. Built with minimal or no metal, it would be much harder to spot on radar. Embedded computers would allow remote activation of any weapon, and more compact power handling would allow greatly improved robotics. Other possible nanoweapons (most of which have known defenses that could be incorporated into NanoShield) include: Arbitrarily large numbers of any robot. Deuterium filters for separating deuterium from seawater. Microscale isotopic separation of uranium. Massive utility fog banks that simply contain all movement in a large region. Computer viruses that make other people’s nanofactories build bombs. Inhalable or skin-penetrating machines that travel to the nervous system, allowing outside sources to take over inputs or outputs. Massive nanofactories could consume a substantial fraction of earth’s CO2. An important question is whether nanotech weapons — both replicating and nonreplicating — would be stabilizing or destabilizing. Nuclear weapons, for example, could perhaps be credited with preventing major wars since their invention. However, nanotech weapons differ from nuclear weapons. Nuclear stability stems from at least three factors. The most obvious is the massive destructiveness of all-out nuclear war. All-out nanotech war is probably equivalent in the short term, but nuclear weapons also have a high long-term cost of use (fallout, contamination) that would be much lower with nanotech weapons. Nuclear weapons cause indiscriminate destruction; nanotech weapons could be targeted. And nuclear weapons require massive research effort and industrial development, which can be tracked far more easily than nanotech weapons development. Finally, nanotech weapons can be developed much more rapidly due to faster, cheaper prototyping. **Greater uncertainty of the capabilities of the adversary, less response time** to an attack, **and better targeted destruction** of an enemy’s visible resources during an attack all **make nanotech arms races less stable.** Also, unless nanotech is tightly controlled, **the number of nanotech nations** in the world **could be much higher than** the number of **nuclear nations, increasing the chance of a regional conflict blowing up.**

## Environment Turn

Nanotech kills river bacteria which are key to much of the food chain.

**SFC 5** writes[[6]](#footnote-6)

The U.S. government should spend more money investigating potential health and environmental hazards of nanotechnology, a leading environmental group says. New types of **materials** and chemicals that are invisibly small -- i.e., with diameters **measured in nanometers**, or billionths of a meter -- **have** many **possible** valuable **uses in** medicine, **environmental cleanups**, water treatment, energy production, technology and other areas, representatives of the Washington-based group Environmental Defense acknowledged at a news conference Wednesday. **However, uncertainties linger over** the **possible harm** of nanomaterials and nanoparticles **on** human health and **the** environment, they cautioned. For example, **nanoparticles** used as anti-tumor agents are so small that they might slip inside the human brain and perhaps damage it. Likewise, if **leaked from a factory**, the particles **might destroy river bacteria, which lie at the base of much of the food chain**. Because the toxic aspects of nanotechnology remain a frontier subject of research, "our traditional ways of thinking about hazardous materials are going to have to broaden a bit," said Dr. John Balbus, the organization's health program director. He and three colleagues wrote an article about the potential downsides of nanotechnology for a recent issue of the journal Issues in Science and Technology, a joint publication of the U.S. National Academy of Sciences and the University of Texas.

## Heidegger Turn

Nanotech transforms atoms into a standing reserve.

**Scrinnis 7** writes[[7]](#footnote-7)

These techno-scientific characteristics will in turn constitute or enable the extension and continued transformation of the ecological relations of the contemporary food system. **Nanotech**nology greatly **extends the ability to engage with**, transform **and reconstitute nature at the atomic and molecular levels, including** the **engineering of** thoroughly novel organisms, **materials and final food products.** While this level of engagement with nature is not in itself new, its reach and the ability to apply it in a wider range of situations is being radically enhanced. This mode of engagement involves encountering nature — ie. plants, animals, microorganisms, wholefoods — as being constructed from a set of standardised and increasingly interchangeable nano-molecular components (Scrinis, 2006a). **There is little respect here for** the **integrity of** the **objects of nature** in their received form**, for all are encountered as plastic and malleable, a standing-reserve of raw material** (Heidegger, 1977) **ready to provide useful components, to be re-engineered from the atom up**, or whose self- assembling properties at the molecular level are to be harnessed, in order to meet the requirements of — and to be smoothly integrated into — the dominant agri-food system (Dupuy, 2007). This more abstract mode of encountering nature will increasingly define the character of food production practices and products as it works its way through the system, including plant and animal breeding and production practices, food processing techniques and products, and consumption practices.

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